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A River of Energy Solutions

Integrating Energy and Master Planning Using an Enterprise Approach

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Scope

U.S. Department of Defense installations have embraced new principles and are implementing base planning practices that are sustainable and energy efficient. This workshop will discuss how to use installation planning techniques to integrate principles of sustainability and energy efficiency.

Agenda

- Part I Planning in the US Military
- Part II Inefficient Planning in Theory and Practice
- Part III Principles and Case Studies of Energy Efficient Planning

Part I

Planning in the US Military

Master Planning: a critical installation responsibility

Installations are like towns and cities of America with citizens, living, and working with great neighborhoods.

All the Military Departments require that each base must have a base master Plan that establishes a long-term plan for the sustainable, energy efficient Development while preserving long-term military capabilities.

Planning follows the traditional planning practices that Cities and towns of America.

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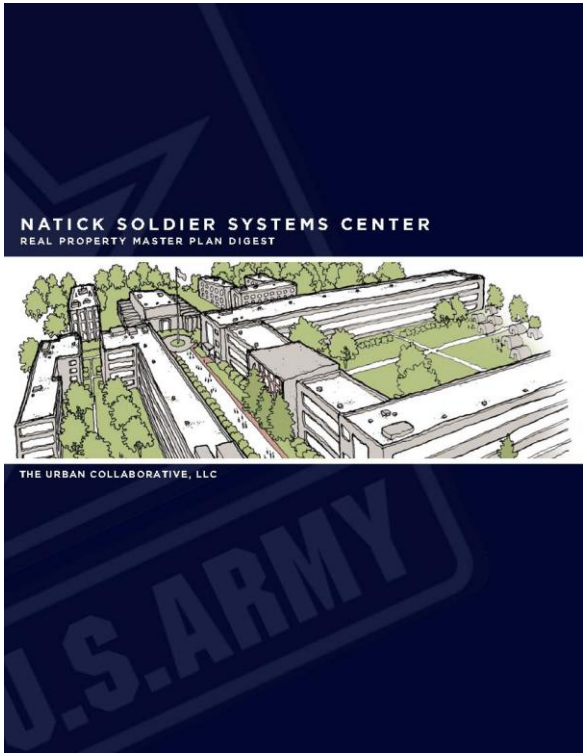
What is a Master Plan

A Master Plan documents the long-term vision for the comprehensive development of an installation.

- ✓ Defines all investment required to achieve the vision
- ✓ 20-30 year out
- ✓ All installations must have a master plan
- ✓ All stakeholders participate in the plan
- ✓ Stakeholder, collaborative process.
- ✓ Identifies all investments and the way they will be developed over the 20-30 years



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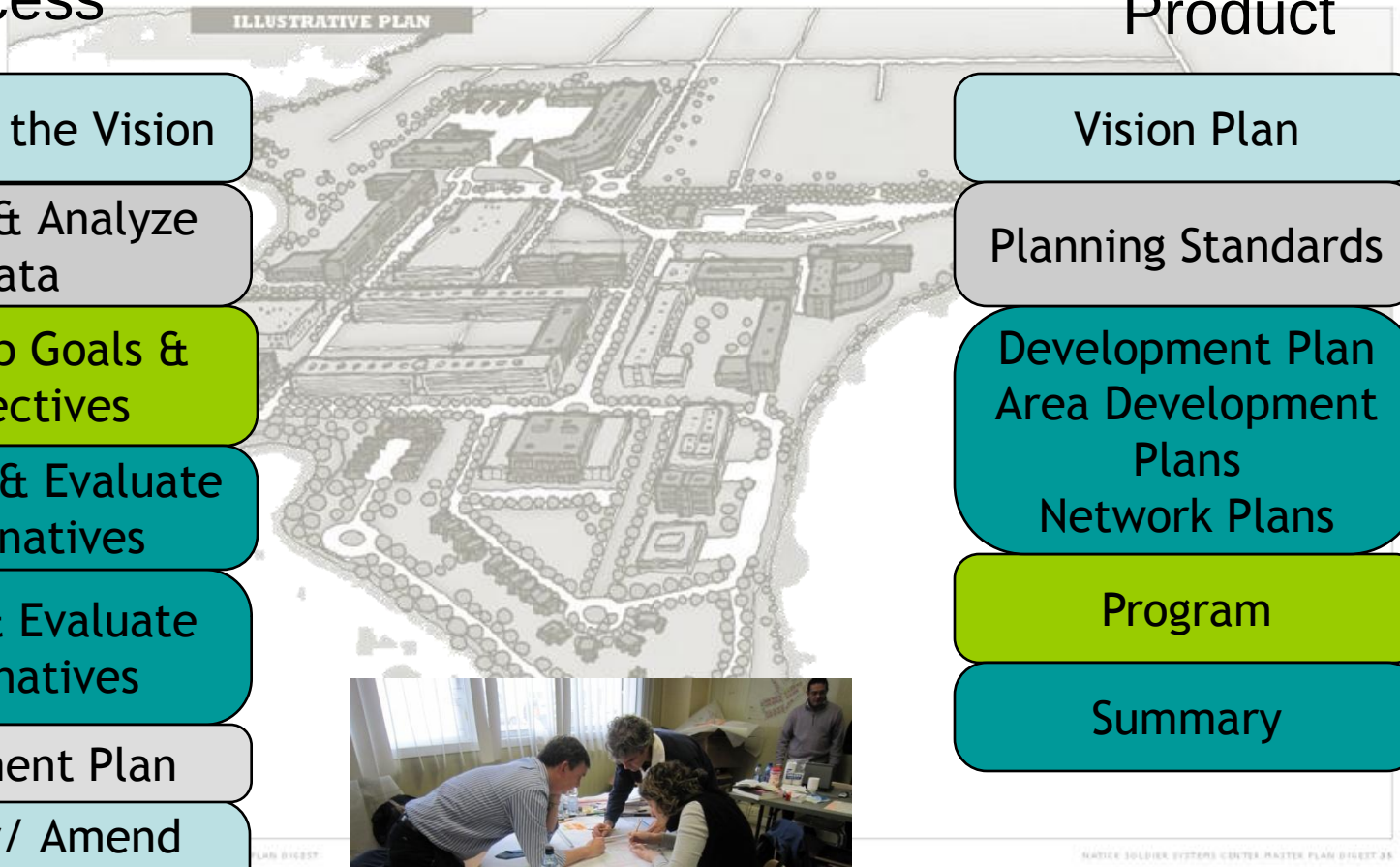
Making a Master Plan

Process

- Establish the Vision
- Collect & Analyze data
- Develop Goals & Objectives
- Develop & Evaluate Alternatives
- Select & Evaluate Alternatives
- Implement Plan
- Monitor/ Amend Plan



Product

- Vision Plan
- Planning Standards
- Development Plan
  Area Development Plans
  Network Plans
- Program
- Summary

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Enterprise Installation Planning

Sustainability	Energy	Health	Quality of Life
Low Impact Development	Net -Zero	Rapidly Evolving Missions	Public- Private vs Land availability

Yr 1 **INSTALLATION PLANNING** Yr 30

Establishes integrated planning & development Practices, for consistent, energy efficient, sustainable development

Reduce carbon Emissions by 11 million lbs/yr by yr 30

Yr 1 **DESIGN AND CONSTRUCTION** Yr 30

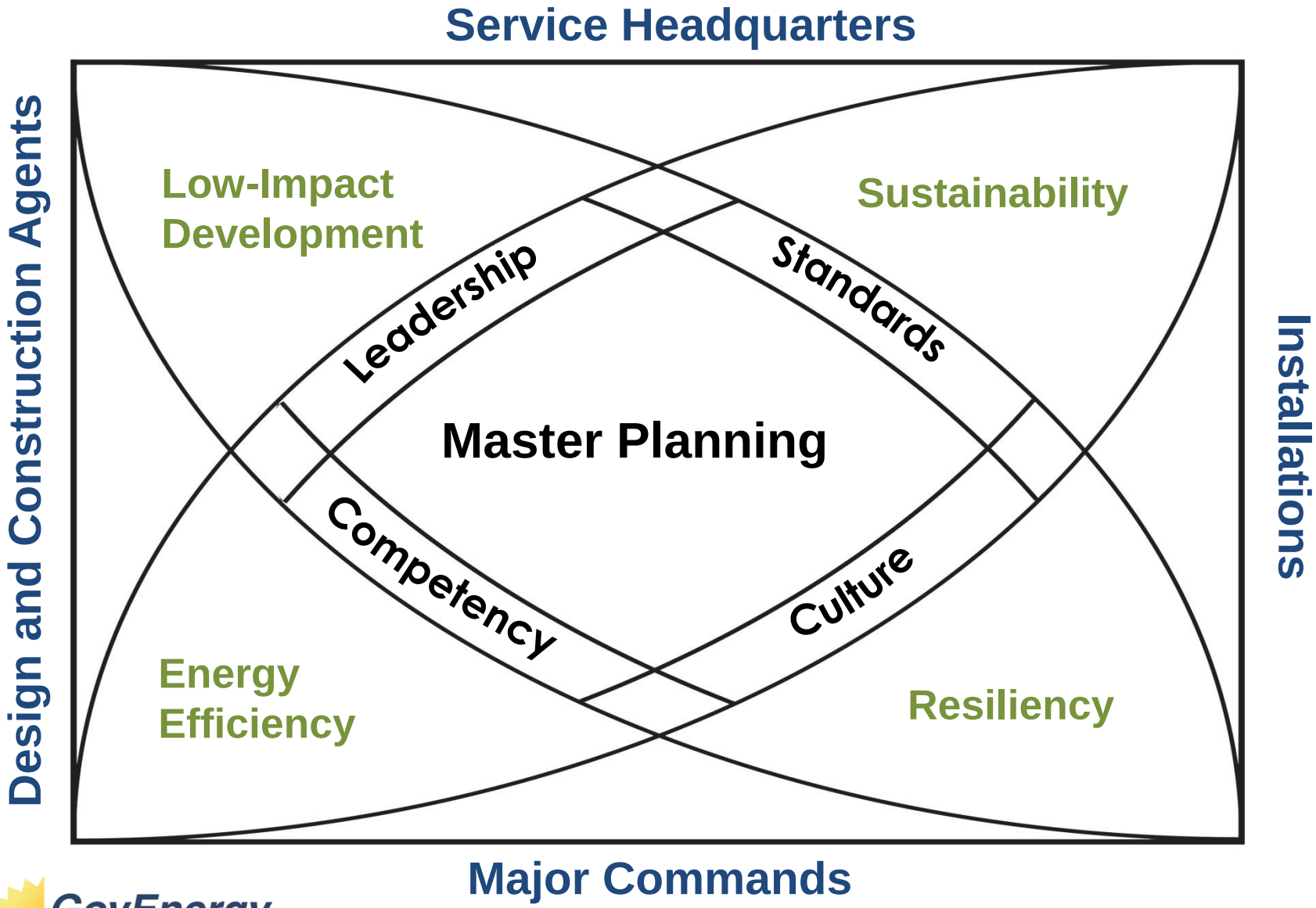
Implement the master planning principles through integrated design practices

Each project can reduce carbon emissions by 100,000 lbs/yr

Yr 1 **OPERATIONS** Yr 30

Ensures planning principles and design intent are Followed consistently through the life of real property.

The Master Planning Enterprise Challenge



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Part II

Inefficient Planning in Theory and Practice

Our military's heavy reliance on fossil fuels creates significant risks and costs at a tactical as well as a strategic level. They can be measured in lost dollars, in reduced mission effectiveness and in U.S. soldiers' lives.

Dr. Dorothy Robyn
Deputy Undersecretary of Defense for Installations and Environment

Auto Focused

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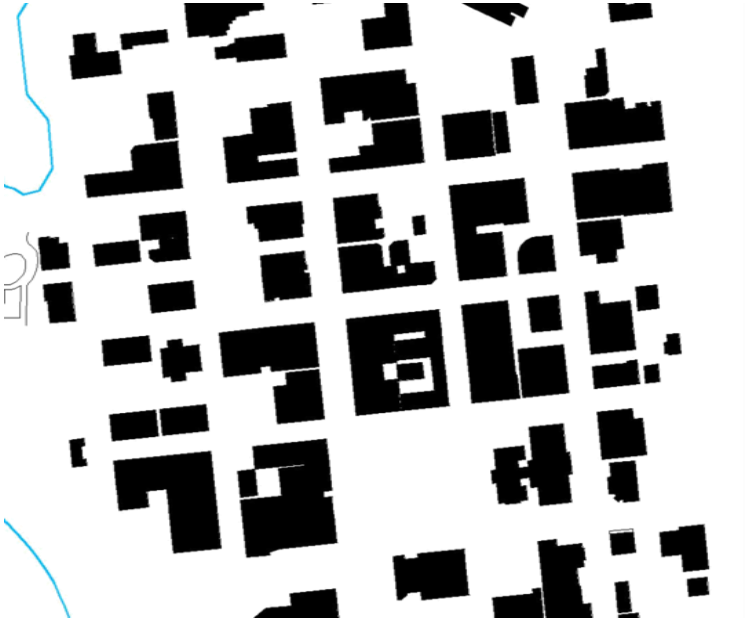
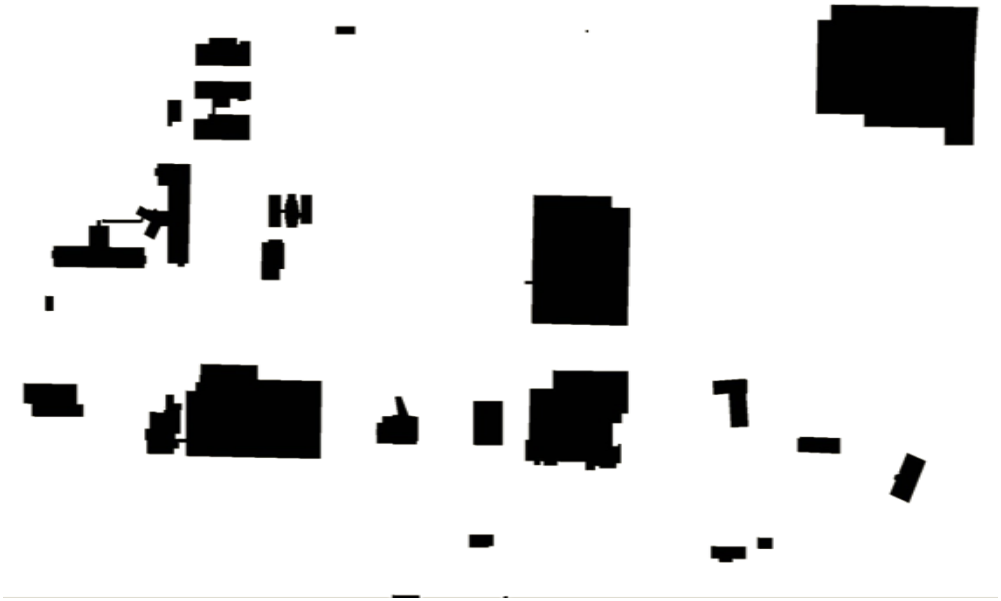
Abundantly Paved

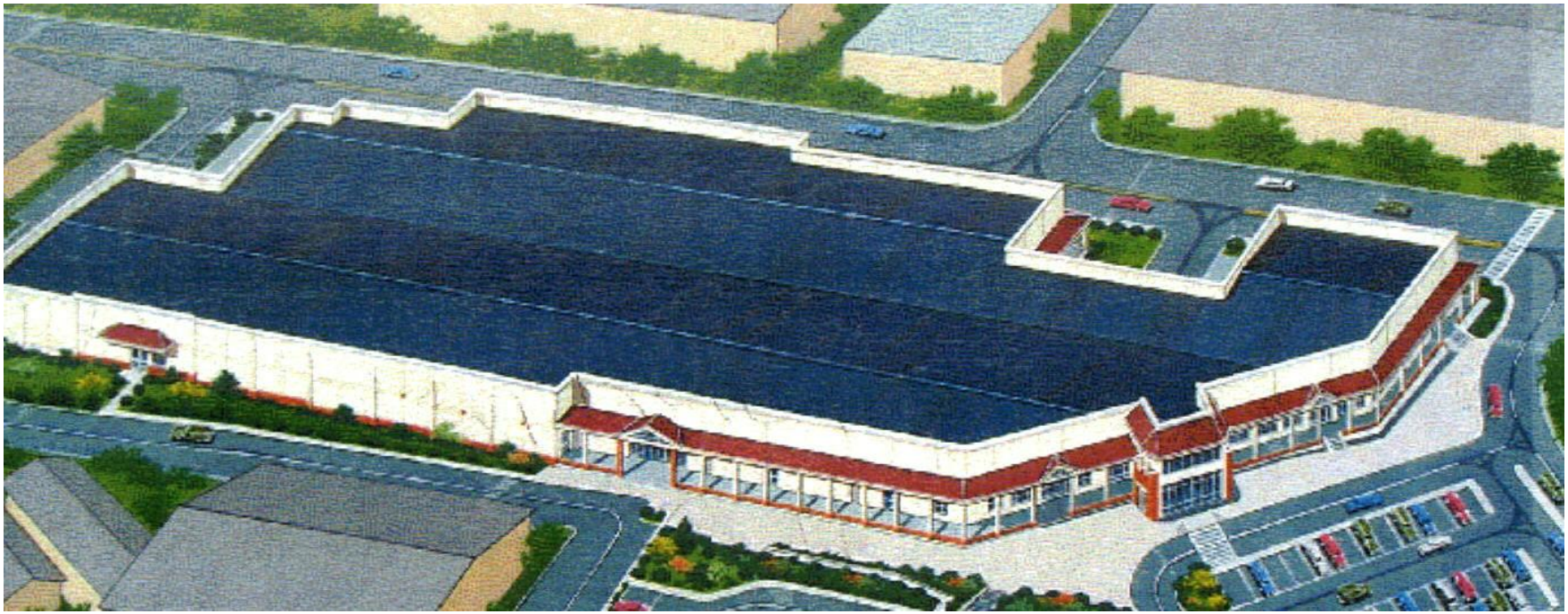
Widely Spaced



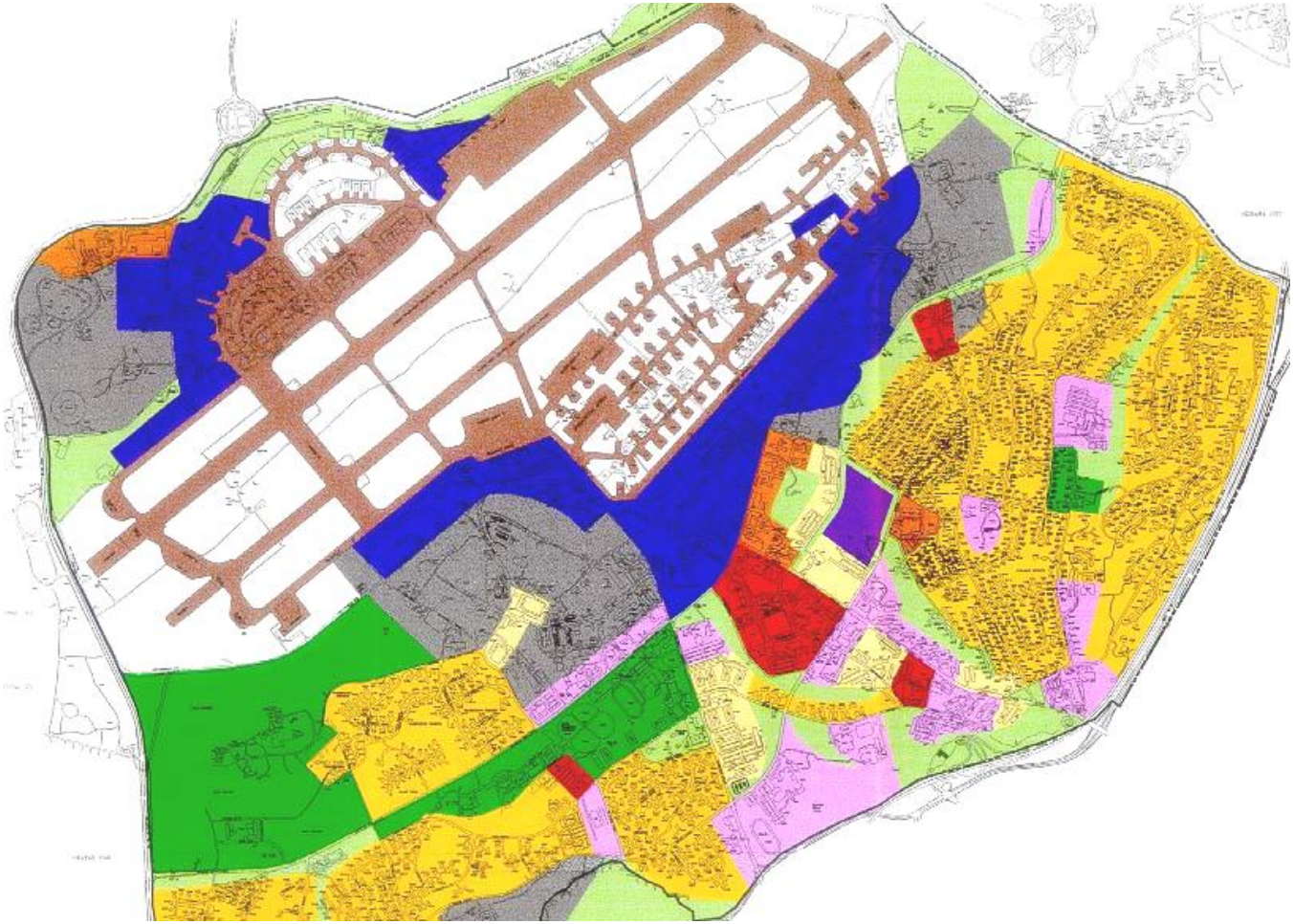


Haphazardly Ordered

Increasingly Franchised



Clearly Segregated



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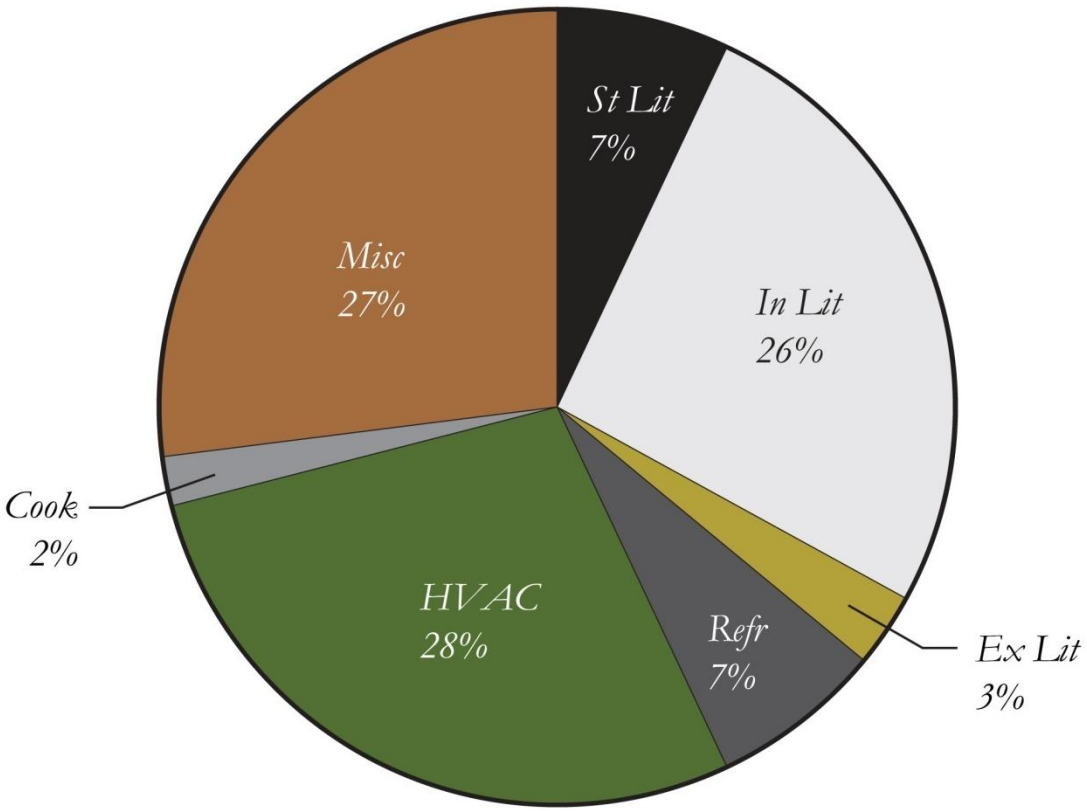
Energy Inefficient

Estimates of Energy Consumption by Building Type and End Use at U.S. Army Installations by Lawrence Berkeley National Laboratory, 1996.



KEY FINDINGS

1. Interior lighting and HVAC account for 54% of total energy consumption

2. Strategies that can reduce need for interior lighting and HVAC will produce biggest benefits

- Narrow Wings
- Operable Windows

Bottom Line

To significantly reduce energy use, planning of the built environment must accommodate narrow wings.

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Part III

Principles and Case Studies of Energy Efficient Planning

Lt. Gen. Rick Lynch
Commander of Installation Management Command

"To achieve net-zero energy, garrisons start with aggressive conservation efforts, to reduce the amount of energy being used in the first place.

Then, they repurpose energy, or find secondary uses for building exhausts, boiler stack exhausts and other thermal energy streams, and recover heat from the electricity generation process.

Once they have reduced their load through conservation and efficiency measures, they can meet their remaining requirements through renewable or alternative energy projects."

From Fort Belvoir Eagle, 24 February 2011

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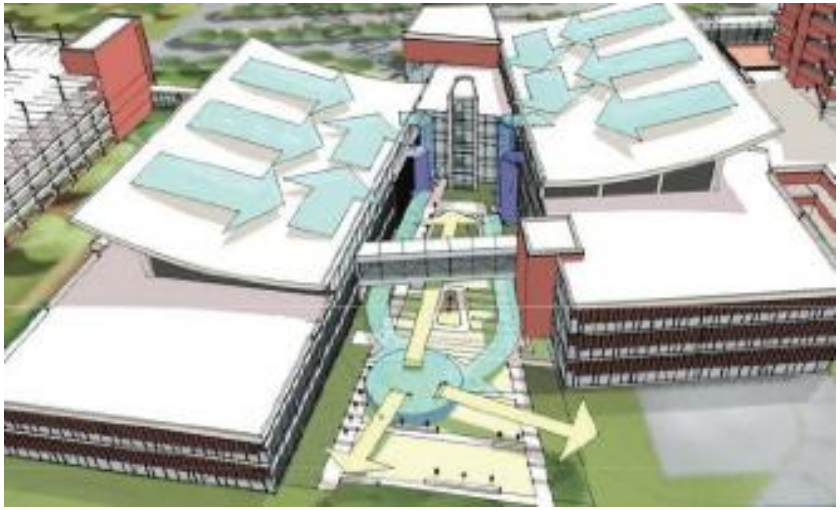
Skate
Park



Fort Belvoir Community Hospital

The hospital will consume approximately 30 percent less energy through the use of a multistack heat recovery chiller system for reheating, high efficiency variable speed drive chillers, variable air volume devices, an energy efficient lighting design that includes daylight harvesting, and a rainscreen system.

Several strategies will be employed to reduce water consumption, including the use of a rainwater and condensate collection system, which will direct water from the swooped roofs to two underground cisterns that will hold a combined total volume of 160,000 gallons. The water will be reused to irrigate the on-site landscaping.

Fort Belvoir Neighborhood Center

LEED Platinum

Built in a walkable, mixed-use neighborhood, energy-saving features including a geothermal heat pump system, photovoltaic solar panels, and efficient lighting controls resulted in a 70% reduction in energy and a 43% water savings over traditional buildings of its kind.

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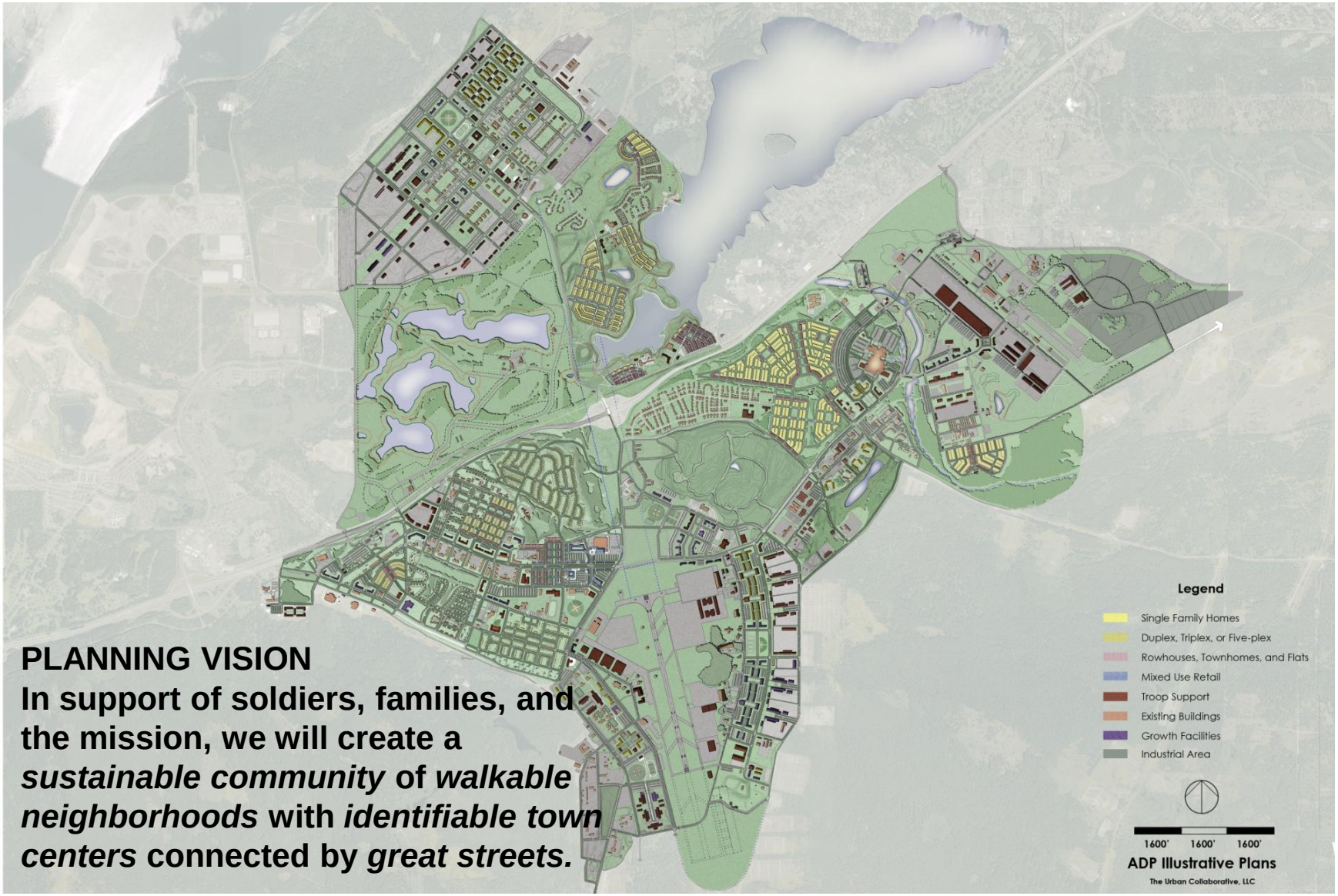

PLANNING VISION

In support of soldiers, families, and the mission, we will create a *sustainable community* of *walkable neighborhoods* with *identifiable town centers* connected by *great streets.*

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The Urban Collaborative, LLC

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	Green Admin	Typical Army Admin
Morphology	Narrow Wings	Wide Wings
Windows	Operable	Fixed
Daylighting	Extensive	Minimal
HVAC	Passive with support	Active
Results	10.57 kWh/sf (3)	20.07 kWh/sf (1996) (1) 18.6 kWh/sf 2008 LEED Silver Median (2)

(1) Estimates of Energy Consumption by Building Type and End Use at U.S. Army Installations by Lawrence Berkeley National Laboratory, 1996.
(2) Energy Performance of LEED® for New Construction Buildings, 2008.
(http://www.usgbc.org/ShowFile.aspx?DocumentID=3930)
(3) Based on data from Netherlands International Bank redevelopment project

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Mixed-use neighborhoods can reduce energy consumption by up to:

50%

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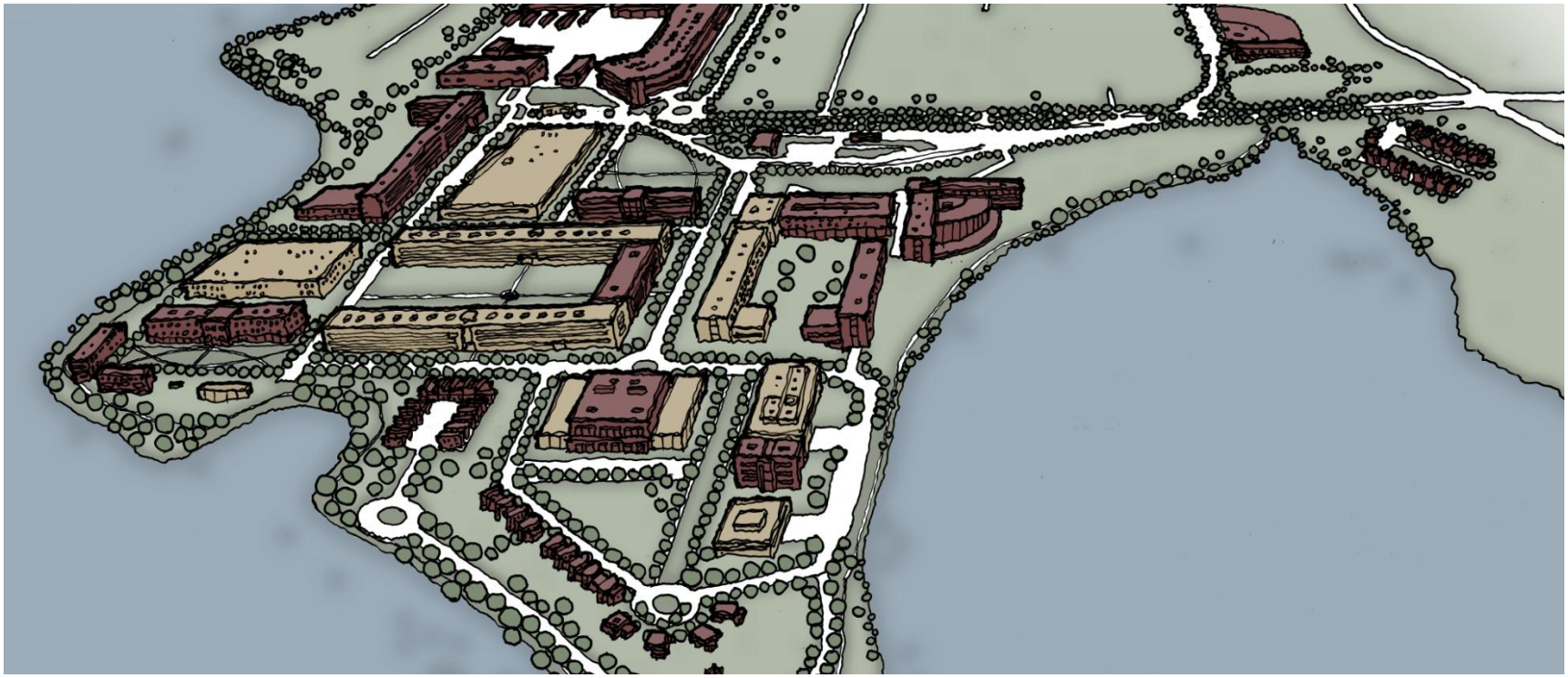
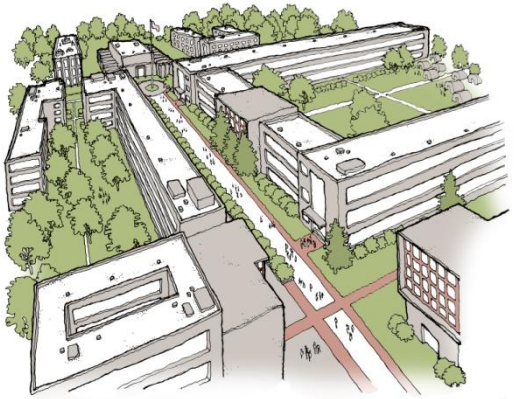
Natick Soldier System Center





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Natick Trigeneration
From one energy source, a trigeneration plant can produce three forms of energy — hot water, chilled water for air conditioning and electrical power.

Energy Benefits
It can produce an up-to-50-percent more efficient system than cogeneration.

Environmental Benefits
15 percent reduction in nitrogen oxide
35 percent reduction in fuel use
45 percent reduction in carbon dioxide
100 percent reduction in sulfur dioxide

Mixed Use

Because district energy systems must be designed to handle peak energy demand ('peak loads') they perform better and are even more cost-effective when energy demands are spread throughout the day. Dense mixed-use neighborhoods contribute to load diversification, since they have energy demands at different times of the day. This load diversification improves the economic performance of a system, since the heating or cooling capacity is used more evenly throughout the entire day.

Sufficient density

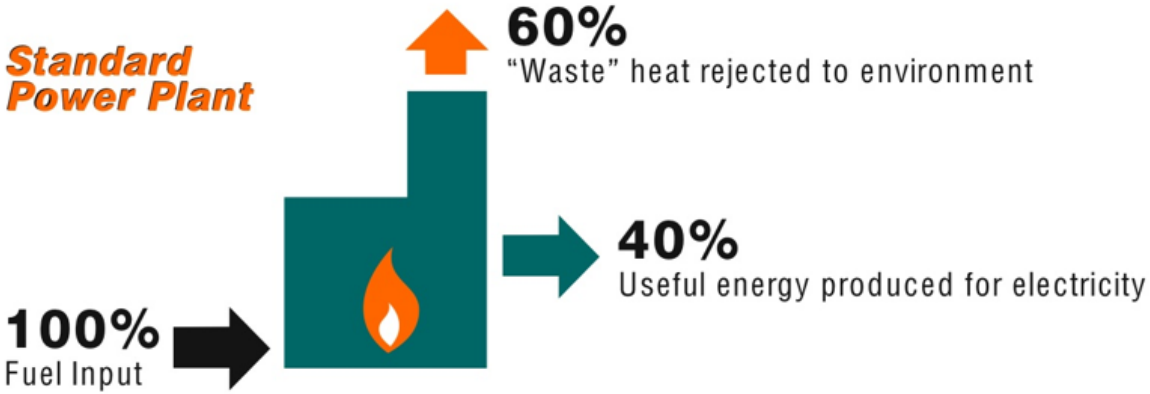
Installations need to create areas with sufficient building density, so that energy demand is high enough to make investing in district energy worthwhile.

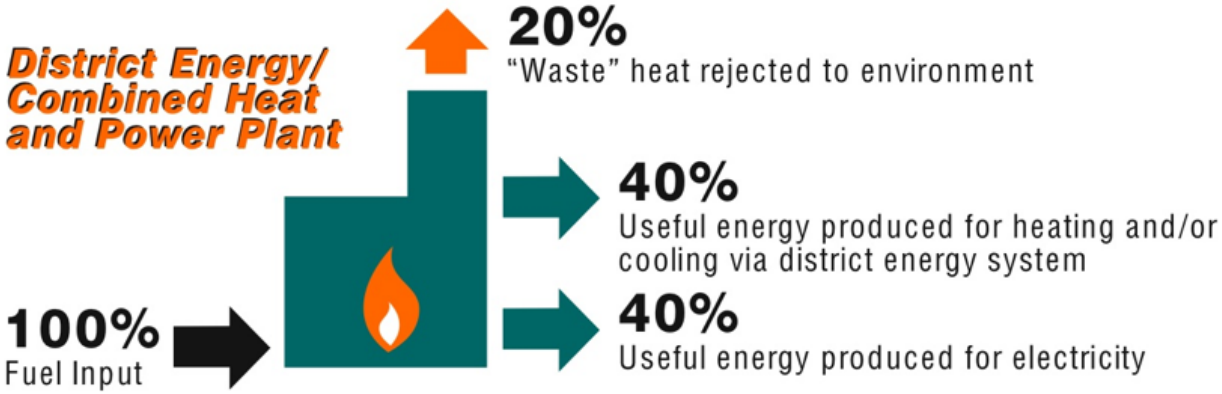
Strategic development sites

Infill development, adaptive-use, and clusters of under-utilized buildings that are slated for retrofit can contribute to the demand for plant construction. Hospitals and campuses are examples of institutions with high energy demands that justify on-site generation

The Role of District Energy in Greening Existing Neighborhoods. A PRIMER FOR POLICY MAKERS AND LOCAL GOVERNMENT OFFICIALS. Preservation Green Lab, National Trust for Historic Preservation Center for Sustainable Business Practices, University of Oregon

Energy-Efficiency Comparisons





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Net Zero Water

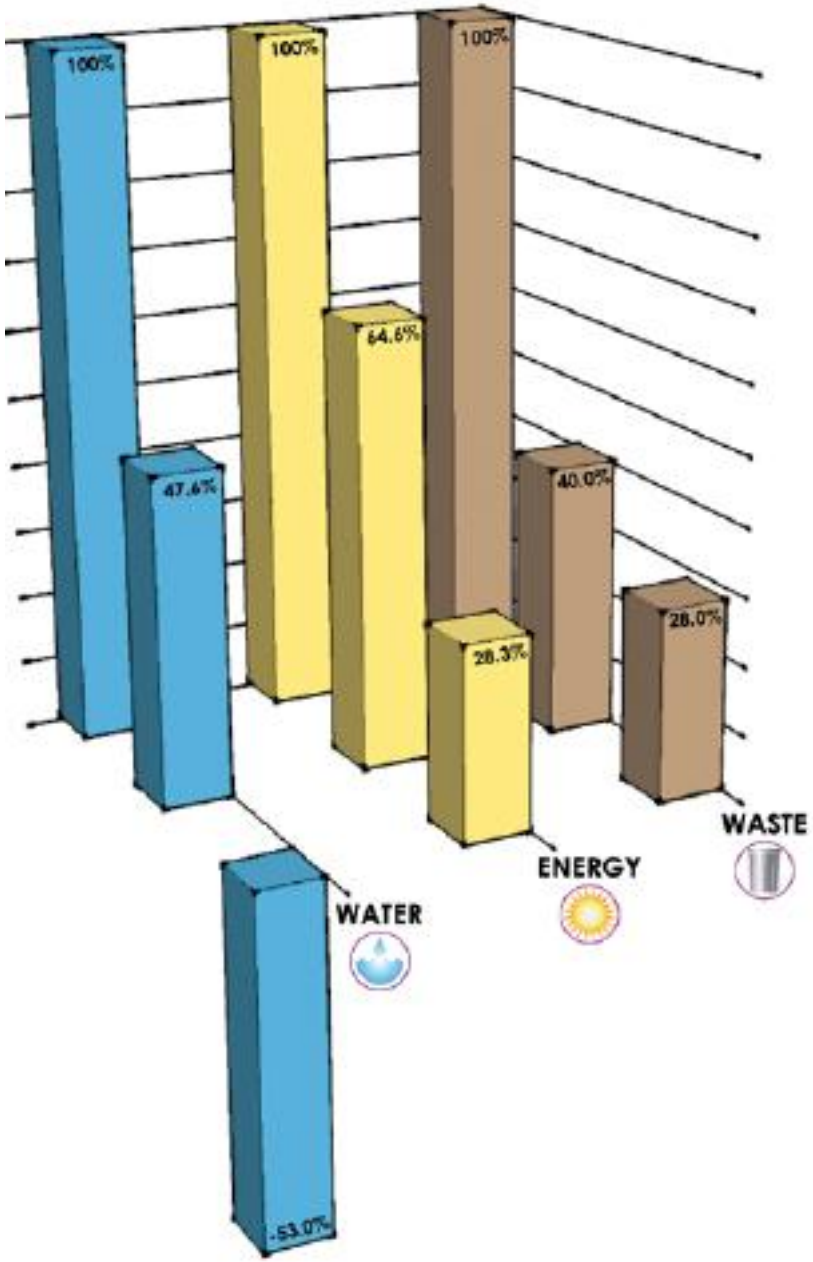
153% reduction achieved by master plan

Net Zero Energy

71.7% reduction achieved by master plan

Net Zero Waste

72.0% reduction achieved by master plan



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Reduce heat loss and heat gain through shared envelope

35%

Density matters in terms of sustainable development. Doubling density beyond 30 employees per acre, or 13 residents per acre, is associated with more than a 30 percent decrease in vehicle miles traveled (VMT) and total air pollution.[i]

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[i] Design, Community & Environment et al., *Understanding the Relationship Between Public Health and the Built Environment,* Prepared for LEED-ND Core Committee, Congress for the New Urbanism, 2006.

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[i] Norman, J, MacLean H., and Kennedy, C, "Comparing high and low residential density: a life cycle analysis of energy use and greenhouse gas emissions," *Journal of Urban Planning Development.* 132:10–21, 2006.

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When more compact development patterns are used, Rutgers University researchers have found that construction costs can be reduced: road costs can be reduced by 25% and utility costs by 10%.[i]

[i] *Economic and Fiscal Impacts of Alternative Land Use Patterns*, by Robert Burchell, Rutgers University.

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